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AVIATION AND AIRCRAFT JOURNAL

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VOLUME XI
Number 10

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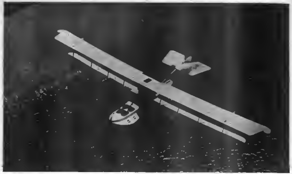
SPECIAL FEATURES

REPORT ON BOMBING TESTS
THF GALLAUDET MULTIPLE DRIVE
CALIBRATION OF CARBURETOR JETS
NEW ITALIAN SEAPLANES
AIRSHIPS IN 1921

The GARDNER, MOFFAT CO., Inc.
HIGHLAND, N. Y.
225 FOURTH AVENUE, NEW YORK



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SEPTEMBER 5, 1921

AVIATION AND AIRCRAFT JOURNAL

VOL. XI. NO. 10

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AVIATION AND AIRCRAFT JOURNAL

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Vol. XI SEPTEMBER 5, 1921 No. 10

The Loss of the R-38

THE accidental destruction of the rigid airship R-38 over Hull, England, with the attendant loss of forty-four out of her crew of forty-nine is a heavy blow to the world of lighter-than-air craft. Among those who went down with the R-38 America and Great Britain lose some of their most distinguished exponents of rigid airship design and operation, for men like Colonel Campbell, Air Commodore Maitland, Commander Maxwell, Lieutenant Pritchard—to name but a few—represent a force in a comparatively undeveloped art which it can ill afford to lose.

We do not, however, for a moment believe that this loss, however grievous it be, will succeed in halting even temporarily the further development of rigid airships. While these craft have by no means attained that state of comparative finality which seems to characterize today's heavier-than-air craft, their performances in the past prove beyond doubt that a rigid airship of well proven design is no longer a piece of experimental engineering.

And here it is necessary to add that the R-38, far from being a well tried type of airship, represented an experimental design which embodied many novel ideas the merit of which has yet to be demonstrated. Experimentation with designs which mark more than a superficial departure from orthodox practice often end in accidents, and the R-38 was, unfortunately, no exception to this rule.

It seems pretty well established that the R-38 proved, from the very day of her first inflation, structurally weak. Trouble was experienced from girders which would buckle and this trouble, though temporarily remedied, appeared again in one of the early trial flights. As a result the hull had to be strengthened in several parts, but even so the framework does not seem to have acquired much additional strength, for the ship broke in two apparently because the helm was put hard over. So much, at any rate, may be gathered from statements made by some of the survivors.

It may be asked why the Navy Department should have spent abroad a large sum of money in acquiring an experimental type of airship which might have been built in this country by American engineers. The latter would thus have had an opportunity of working out their own theories and of building up an American school of rigid airship design to which we must come sooner or later. Even if the first ship of such a national design would have been a failure, it would have afforded a wealth of experience which would have made worth while the expenditure.

The desire of the Navy Department to acquire a ready-made airship may be understood, but in this case it would have perhaps been better to try to get one of Germany's latest Zeppelins—which our participation in the victory entitled us to—before all the airships were apportioned among the Allies.

Regulating Civil Aviation

THE announcement by Underwriters' Laboratories to the effect that they are now prepared to issue certificates to aircraft and aircraft pilots answering a set of requirements which are based on the provisions of the International Convention for the Regulation of Air Navigation and the Air Regulations of Canada, marks a notable advance in the process of putting aviation on a safe and sane basis.

When, after the termination of the war, civil aviation asserted itself as a new force of progress in the destinies of nations, it became at once obvious that lest it be directed into sound channels it might soon turn into chaos and so defeat its own legitimate purposes. The Peace Conference sought to prevent this by incorporating in the Peace Treaty the International Air Convention, and it succeeded in doing this insofar as the Allies are concerned, all whom became parties to that convention. But as the United States failed to ratify the Versailles treaty, it has likewise remained outside the air convention and so far no federal air legislation has been enacted by Congress.

That this omission will be made good before long seems now certain. In the mean time Underwriters' Laboratories's plan to register aircraft and pilots "to assist in securing general recognition of safe practices in aircraft operation" will be warmly welcomed by all those who are concerned with the healthy development of civil aviation.

While a private organization naturally lacks the means for enforcing the registration of pilots and of aircraft—which alone federal legislation can bring about—it can nevertheless exert a beneficial influence in this direction by making it desirable for aircraft operators to possess a certificate of competency issued by a responsible agency. The past record of Underwriters' Laboratories should vouch for their responsibility and the recent appointment of Major Schroeder, who will head their aeronautical department, is a brief that the work of examining pilots as to competency and aircraft as to airworthiness will be conducted in such manner as to justify the faith of all those associated with aeronautics.

It should be noted that the registration plan of Underwriters' Laboratories is entirely independent of any insurance scheme. It is merely a means of enabling operators of aircraft to prove to their customers that the machine on which they go up has been certified as safe and that the pilot in charge of it has been pronounced fit to fly it. The nominal charge which the registration involves makes it certain that the plan will not cut deep into the finances of even the smallest firm. On the other hand the public will at last have a means of distinguishing between aircraft that are certainly airworthy and those that may or may not be. That this will give the public a greater confidence in the safe features of aviation is natural, for it will tend to weed out irresponsible pilots and obsolete aircraft.

Report on Bombing Tests

By Our Washington Correspondent

The ability of airplanes to sink naval vessels with bombs is made the subject of a long report prepared by the Joint Board of the Army and Navy and published at the direction of the Secretary of War and the Acting Secretary of the Navy.

The report is a direct result of the series of tests held during June and July last off the Virginia Capes, during which the one time German naval vessels, the submarine U-117, the destroyer G-102, the light cruiser Frankfurt and the battleship Ostfriesland were sunk by aerial bombs. The document was signed by General Pershing, Chief of Staff of the Army and senior member of the Joint Board.

Much of the report is made up of conclusions which have been reached, the Joint Board announces, after a study of the reports of the Boards of Observers, "actual observation of the experiments by one or more members of the Joint Board" and "the general knowledge of the principles of war and methods of conducting war". The findings of the Board of Observers designated for the tests, who were close to the vessels when they were bombed and who went aboard both the Frankfurt and Ostfriesland at intervals, has been withheld from publication.

"The aviation and ordnance experiments conducted with the ex-German vessels as targets have proved that it has become imperative as a matter of national defense to provide for the maximum possible development of aviation in both the Army and Navy", the Joint Board declares.

But at the same time the report hastens to deny that the battleship, as a result of airplane development is obsolete. The battleship, it is asserted, still remains the greatest factor of naval strength.

"The development of aircraft instead of furnishing an economical instrument of war leading to the abolition of the battleship has but added to the complexity of naval warfare," the report says in arguing the question.

The members of the board go into a lengthy discussion of the entire subject of the ability of airplanes to bomb battleships effectively, at times getting far afield from the experiments of June and July. At least a part of the ground covered is easily recognized as that which has appeared before in the arguments against the airplane in operations over water.

The text of the report is as follows:—

August 16, 1921

To:

The Secretary War and
The Secretary of the Navy

SUBJECT: Reports on results of aviation and ordnance tests held during June and July, 1921, and conclusions reached.

The Joint Board submits the following report on the results of the aviation and ordnance experiments held during June and July, 1921, and its conclusions based thereon.

Nature of Experiments and the Results

2. Certain ex-German war vessels having been turned over to the United States Government in accordance with the decision of the Supreme Council as to their allocation, the Navy Department decided to comply with the provision requiring their destruction by conducting a series of experiments in which these vessels were to be sunk by gunfire or by bombs dropped from aircraft. In order that both branches of the national defense might gain the maximum benefit the Secretary of the Navy invited the Army to participate in these experiments.

3. In addition to the experiments with the ex-German vessels as targets, one was conducted with the ex-Iowa steaming under radio control as a hypothetical enemy. Search was conducted by aircraft and attacks made using dummy bombs from 4,000 feet altitude. This experiment was conducted with a view to obtaining information as to the effectiveness of aircraft in search operations, the ability of aircraft to concentrate for effective attack on a vessel at sea, and the percentage of hits which could be made by dropping bombs from this altitude under the most favorable conditions against a slow moving target capable of changing course at will to decrease the accuracy of bombing.

4. The aviation experiments were successfully conducted under the direction of the Commander-in-chief Atlantic Fleet by the Air Force of the Atlantic Fleet and a Provisional Air Brigade of the Army. The gunfire experiments were conducted by destroyers and battleships of the Atlantic Fleet.

5. The experiments extended over the period from June 21 to July 21, and resulted in the sinking of the ex-German vessels and indicated below:—

Type	*How Sunk*	*Date*
Submarine U-117	Bombs	21 June
Submarine U-140	Gunfire	22 June
Submarine UB-48	Gunfire	22 June
Destroyer G-102	Bombs	13 July
Destroyer S-132	Gunfire	15 July
Destroyer V-43	Gunfire	15 July
Light Cruiser Frankfurt	Bombs	18 July
Battleship Ostfriesland	Bombs	21 July

6. The schedule of experiments was so arranged as to obtain the greatest amount of information for the practical development of aviation and ordnance including weapons, their appurtenances, and projectiles. Boards of Observers were appointed by the War and Navy Departments.

7. The experiments definitely determined in each case that the projectiles used were superior to the defensive features of construction of the vessel attacked. It has long been recognized that the gun carried by any type of war vessel is superior at moderate ranges to the armor or protective construction of vessels of like type. In a large measure, therefore, the greatest interest in these experiments lay in the bombing of naval vessels by aircraft. The main features of this report, therefore, relate to the effectiveness of aircraft in offensive action against various types of naval vessels.

8. The Joint Board has carefully studied the reports of the Boards of Observers and as a result of such study, actual observation of the experiments by one or more members of The Joint Board, and general knowledge of the principles of war and methods of conducting war, has arrived at the following general conclusions:

General Conclusions

9. Within their radius of action which, relative to that of naval vessels, is extremely short, the effectiveness of heavier-than-air craft carrying large capacity high explosive bombs, depends upon—

(a) Ability to locate the naval vessel,
(b) Ability to hit the target vessel with the projectile carried,
(c) Ability of the projectile to damage or destroy the vessel.

Consideration of Ability to Locate the Naval Vessel

10. Aircraft of any of the three general classes—lighter-than-air ships, flying boats and land planes, either in combination or singly, have pronounced ability to search sea areas within their radii of action and to locate naval vessels operating in such areas. The high speed of aircraft and the range of visibility obtained by altitude are factors which make these craft especially valuable in the Service of Information.

11. Heavier-than-air craft may obtain the maximum radius of action for use in the Service of Information only by carrying additional fuel in place of heavy bombs. When armed with heavy bombs the radius of action of heavier-than-air types is inadequate for extensive search operations. Therefore, to conduct an effective attack on naval vessels it

will usually be necessary to have certain aircraft for searching and others for conducting the attack with bombs.

12. Darkness, fog, falling or squally weather, will greatly reduce the effectiveness of aircraft in search operations. Most of these conditions likewise adversely affect surface vessels conducting such operations but not to the same extent.

13. The present dependability of the personnel and material of Army and Navy aircraft appears to be such as to ensure that search operations, under suitable conditions can be conducted without an undue percentage of loss. The further development of aircraft will undoubtedly increase both dependability and radius of action.

Ability to Hit the Target Vessel with the Projectile Carried

14. The number of dummy bombs which actually hit the target during the experiment with the ex-Iowa was a very small percentage of those dropped. Other experiments, however, showed that it is not necessary to make direct hits on naval vessels to put them out of action or to sink them, provided the bombs drop sufficiently close to the vessel and the explosive charge is sufficiently large to produce a mine effect of such proportions as to destroy the water-tight integrity of the vessel beyond the control of its personnel and pumps. The effective target for the bomb being, therefore, greater than the deck area of the target vessel, the percentage of effective bombs would be greater than the percentage of actual hits.

15. Inasmuch as these experiments were not conducted under battle conditions it is difficult to draw conclusions as to the probability of hitting a target with bombs from aircraft while in action. Under the favorable conditions existing during the experiments—namely, stationary, or practically stationary, target, immunity from enemy interference and excellent visibility and flying conditions, the percentage of hits was greatly in excess of that to be expected under battle conditions.

16. The probability of hitting will be reduced in the case of a target moving at high speed on varying courses; further reduced if the target vessel is protected by effective anti-aircraft armament, and practically negligible if the target is protected by effective pursuit planes. On the other hand the probability of hitting will be increased by more efficient sighting and bomb-dropping control apparatus, by further training and further development of aerial tactics.

17. In the present state of anti-aircraft defense it is believed that, if an air force can obtain the mastery of the air, an effective percentage of hits can be obtained against surface vessels coming within the radius of action of bombing planes without an undue percentage of loss of aircraft. Anti-aircraft armament is in an early stage of development. The history of war indicates that means of defense develops rapidly to meet the development of offensive weapons. The effectiveness of the bomb carried by aircraft emphasizes the necessity for the rapid development of anti-aircraft armament and for the provision of pursuit planes as a part of the fleet.

Ability of Aircraft to Damage Naval Vessels

18. Aircraft carrying high-capacity high-explosive bombs of sufficient size have adequate offensive power to sink or seriously damage any naval vessel at present constructed, provided such projectiles can be placed in the water close alongside the vessel. Furthermore, it will be difficult, if not impossible, to build any type of vessel of sufficient strength to withstand the destructive force that can be obtained with the largest bombs that airplanes may be able to carry from shore bases or sheltered harbors.

19. High-capacity high-explosive bombs hitting the upper works of the vessel are disastrous to exposed personnel, serious to light upper works, comparatively slight to heavy fittings such as guns, and negligible to turrets. The effect of direct hits was completely local. The most serious effect of bombs is the mining effect when such bombs explode close alongside and below the surface of the water.

20. In the case of major ships the mining effect of a bomb will be materially reduced due to the ability of the personnel to free the ship of large quantities of water by means of pumps to distribute the excess water through the various compartments and to shore up the water-tight doors and bulkheads which are in most serious danger of carrying away due to water pressure.

21. Aircraft, through the medium of machine guns and fragmentation bombs as well as by high explosive bombs of high capacity, possess sufficient offensive power seriously to threaten the exposed personnel of naval vessels unless such vessels are protected by pursuit planes. This emphasizes the necessity for the further protection of personnel and for the provision of aircraft carriers on which such pursuit planes may be based.

22. The effect of the gas bomb has not been determined but it is believed that such bombs possess offensive power which, within the radius of action of the aircraft, is today a serious threat to vessels insufficiently protected by aircraft.

Summary of General Conclusions

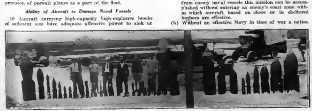
23. At present aircraft possess the following abilities as regards operations with the fleet in areas beyond the radius of action of aircraft based on shore:

(a) Limited assistance to gunnery in the control of fire.
(b) Limited assistance in the Service of Information and Security.
(c) Important strategical and tactical qualities in operations of coast defense.

In adequate quantities they may be the decisive factor in such operations. The availability of those qualities at present depends largely on weather conditions. The radius of action of bombing planes limits their effectiveness against naval vessels to coast defense, or base defense, in which this type is a very powerful adjunct to the present system of coast defense.

24. With reference to the effect of aircraft on future naval construction The Joint Board is of the opinion that:

(a) The mission of the Navy is to control vital lines of transportation upon the sea. If no opposition is met from enemy naval vessels this mission can be accomplished without entering an enemy's coast zone within which aircraft based on shore or in sheltered harbors are effective.
(b) Without an effective Navy in time of war a nation



VARIOUS TYPES OF AIRCRAFT BOMBS EXPERIMENTED WITH AT ABERDEEN PROVING GROUNDS

must submit to an economic blockade fatal to its trade and the importation of necessary materials for the production of war supplies.

(c) If heavier-than-air craft are to be effective in naval warfare they must have great mobility and since their radius of action is not great additional mobility must be obtained by providing mobile bases—i.e., aircraft carriers.

(d) So far as known, no planes large enough to carry a bomb effective against a major ship have been flown from or landed on an airplane carrier at sea. It is probable, however, that future development will make such operations practicable.

(e) Even in the present state of development the aircraft carrier, as exemplified by the Argus of the British Navy, is a type essential to the highest efficiency of the fleet.

(f) Aircraft carriers are subject to attack by vessels carrying guns, torpedoes or bombs and will require as all other types of vessels require, the eventual support of the battleship.

(g) The battleship is still the backbone of the fleet and the bulwark of the nation's sea defense, and will so remain so long as the safe navigation of the sea for purposes of trade or transportation is vital to success in war.

(h) The airplane like the submarine, destroyer and mine, has added to the dangers to which battleships are exposed but has not made the battleship obsolete. The battleship still remains the greatest factor of naval strength.

(i) The development of aircraft instead of furnishing an economical instrument of war leading to the abolition of the battleship has but added to the complexity of naval warfare.

(j) The aviation and ordnance experiments conducted with the ex-German vessels as targets have proved that it has become imperative as a matter of national defense to provide for the maximum possible development of aviation in both the Army and Navy. They have proved also the necessity for aircraft carriers of the maximum size and speed to supply our fleet with the offensive and defensive power which aircraft provide, within their radius of action, as an effective adjunct of the fleet. It is likewise essential that effective anti-aircraft armament be developed.

25 The Joint Board recommends that the provisions of the previous orders of the War and Navy Departments relative to secrecy concerning the results of the aviation and ordnance experiments be rescinded and that this report, if approved by the War and Navy Departments, be issued jointly to the Press.

Army Air Service to Bomb Old Battleship Alabama

Plans are almost completed for the turning over by the Navy Department to the War Department of the old battleship Alabama which will serve as a target of the Army Air Service in another bombing exercise. Air Service officers state that in conducting the bombing exercises with the Alabama advantage will be taken of the things that were learned in the recent exercises so that more definite information can be obtained. It is said there were many phases of attack by aircraft which were not touched upon, and that in this exercise it is expected to clear up some of the questions not heretofore definitely settled, such, for instance, as the effect of toxic gases on the personnel of a vessel, which means that gas bombs will be used; and the effect of concussion on the personnel from the explosion of large bombs (it is expected to drop 4,000-lb. bombs). Torpedoes will also be launched from aircraft and effort will be made in all the exercises to obtain concrete and definite data upon which to form a working basis for the future. The Navy Department has accepted an invitation to participate in the exercises with the Alabama, but they will be directly under the control of the War Department.

After the battleship is turned over to the War Department preparation for the bombing will require several weeks' time. Effort will be made to simulate battle conditions as much as possible, both from the standpoint of the Army Air Service and of the Navy. In order that this may be done the War Department has asked that the ship be turned over in seagoing shape, absolutely watertight, with bulkheads sound, steam in the boilers, and with the ventilating and communicating systems in working order. Request also has been made that her magazines be filled with full loads of powder and that in all respects, except her useful offensive armament which is being salvaged, the ship be ready for action.

It is hardly expected that radio control equipment such as was employed on the ex-Iowa can be obtained. It is hoped, however, to have the ship in motion, probably under tow, when the Army airmen open their attack.

All sizes of bombs will be used, including the 300-lb. bombs similar to the kind that were first directed at the German battleship Ostfriesland, increasing in size to the 4,000-lb. bombs, which are 2,000-lb. heavier than those used on the Ostfriesland, in addition to smoke and gas bombs which will embody several new projects of the Chemical Warfare Service. Penetrative qualities of the gases used will be measured by means of the ventilation system of the ship. The Alabama is a much older ship than was the Ostfriesland, but is protected by an armor belt varying from 16½ in. to 9 in. in thickness as against 11¾ in. to 6¾ in. on the German craft. The protective decks are of about the same thickness.

Effect of a 100-lb. Aircraft Bomb on a Railroad Track, Aberdeen Proving Grounds

Gallaudet Multiple Drive Tested

The Gallaudet Aircraft Corp., East Greenwich, R. I., announces the successful completion of the multiple aircraft engine drive which it has had under development for the GB (giant boat) seaplane now building at the Naval Aircraft Factory in Philadelphia.

The Gallaudet Multiple Drive enables a single propeller to be driven by means of a clutch and gear arrangement simultaneously or separately by three engines. The power unit built for the G.B. seaplane consists of three 400 hp. Liberty engines and the propeller, an 18-footer, is geared down to turn at 800 r.p.m. The power unit was tested on a stand 25 ft. high and operation with one, two and three engines was successfully demonstrated.

The G. B. seaplane, is to be fitted with three such power units, or nine Liberty engines, and will thus have a total horsepower of 3,600. The designed maximum speed is 110 m.p.h. and enough fuel is to be carried for a flight of 3,000 miles at cruising speed. The approximate dimensions of the machine are: span, 150 ft., overall length, 90 ft.; maximum height, 48 ft. The boat is to be 67 ft. in length and 18 ft. in beam, and will be divided into eight water-tight compartments. The framing of the wings will be of steel, while the interplane struts will be of duralumin.

Two Views of the Gallaudet Multiple Drive

The Gallaudet Multiple Drive is intended to fly the giant boat seaplane of the Navy on six Liberty engines (2,400 hp.) keeping one engine on each power unit always in reserve. The importance of this development is as great from the military as from the commercial viewpoint, for it will tend to do away with forced landings due to engine failure, while on the other hand it will make possible a more efficient utilization of the power plant. To appreciate this it is sufficient to visualize the head resistance and structural weight of three Liberty engines mounted in separate wing nacelles as against the Gallaudet Multiple Drive, which unites the three engines in a single streamlined nacelle and which weighs less than 5 lb. per horsepower including the propeller.

"The effort of aeronautical engineers", said Mr. Gallaudet,

Edson F. Gallaudet

"has been to decrease the cost of operation and increase the speed and maximum range of the airplane. Single or isolated engines, attached direct to the propeller, have long been recognized as unsatisfactory in operation and almost impossible to repair during flight. The idea of enclosing three engines in one nacelle has worked out to our complete satisfaction. The gearing down of the speed and the holding of one engine always in reserve, removes the last obstacle to practical transportation by air over great distances. A hundred foot all-metal monoplane, with such a power nacelle, we guarantee can make 150 miles an hour for 20 hours, with twelve passengers aboard. Economy of operation is such that the trans-Atlantic flight or California-Hawaii flight can be made for $600.00 to $700.00 per passenger.

"The grouping of engines into power units, and the giving to the pilot or mechanic complete control over his engine for adjustment or repair, means that there is practically no limit to the size of the airplane of the near future. In transcontinental flights, divisions will be established, such as are now found on railroads. At each division of 300 or 400 miles airplanes will be enabled to change their entire power plant units and proceed without transferring the cargo."

S.A.E. Annual Meeting

The Society of Automotive Engineers has announced that its annual meeting will be held in New York City Jan. 10-13, 1922.

The Meetings Committee suggests that members desiring to present papers communicate with the Society offices at 29 West 39th Street, New York, without delay, since it is desirable that the acceptance of all manuscripts be decided by Oct. 1 in order to provide sufficient time for preparation and circulation of the preprints.

Mr. Praeger Honored

The King of Spain has conferred upon Otto Praeger, of New York City, formerly Second Assistant Postmaster General, and head of the American delegation to the 7th Universal Postal Congress in Madrid last year, the decoration of "Commander with Star of the Royal Order of Isabel la Catolica".

Under Mr. Praeger's leadership the delegates of the twenty-one Latin-American nations joined with the United States and Spain in the creation of a model postal union, cooperating with the Universal Postal Union, but creating a more liberal and more uniform postal administration between the countries involved than the European nations were in a position to agree to in the Universal Postal Congress so soon after the war. Upon his retirement from the postal service last March, Mr. Praeger took up his residence in New York to engage in industrial research and investigation.

Otto Praeger

In the business world Mr. Praeger is known as the creator of the American Air Mail Service and reorganizer on a business basis of postal administration. As postmaster of Washington, 1914-5, he converted a typical public office into a working business concern. He speeded up the delivery of mail 50 per cent, increased letter and parcel post deliveries and collections throughout the city, and extended the postal facilities to take care of 20 per cent increase in business, at the same time reducing operating expenses at the rate of $37,000 per year.

In addition to putting the Washington Postoffice on a thorough business basis, Mr. Praeger in 1914 organized and directed the first government motor vehicle service in the postal establishment and subsequently organized and directed the operation of the large fleets of postoffice motor trucks at Chicago, Detroit, St. Louis, Indianapolis and Philadelphia.

On Sept. 1, 1915, Mr. Praeger was appointed Second Assistant Postmaster General in charge of land and sea transportation, and in charge of the Foreign Mail Service.

He also was directed to investigate and organize an Airplane Mail Service. This very successful venture was launched on May 15, 1918, between New York and Washington and is today an efficient operation from coast to coast. The Airplane Mail Service which Mr. Praeger directed personally for nearly three years is the most extensive and oldest continuously operated air mail service in the world. Mr. Praeger developed the service up to an operation of more than 7,000 miles flying per day and the carrying of more than one ton of letters per day. Experts have pronounced the successful operation of the American Air Mail as a great contribution to civil aeronautics.

During the War, with embargoes on every hand and transportation generally breaking down under the strain of the war load, Mr. Praeger personally supervised the transportation of the mails on land and sea. Despite the greatest handicaps, the transportation of the postal establishment functioned without a break and without serious congestion. It was the only transportation medium that did not have to declare an embargo.

Throughout all this period of stress, Mr. Praeger proceeded steadily with the substitution of business methods for bureaucratic practices in the transportation of the mails and through scientific loading and abolishing of abuses that had crept into the service he effected a saving to the government at the rate of $10,000,000 a year.

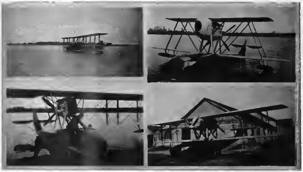
During the war the highest labor turnover among the 18,000 regular mail clerks under Mr. Praeger's jurisdiction was but nine per cent, including loss by draft or voluntary enlistment.

In the Fall of 1920, Mr. Praeger went to Madrid, Spain as the Head of the American Delegation to the Universal Postal Congress and there negotiated a special postal treaty with twenty-two Latin Countries, whereby these countries agreed to accept for delivery letters, newspapers and trade literature from the United States at our domestic rate of postage instead of at the 100 per cent higher foreign rate. After twenty-three years negotiations with foreign countries our government heretofore had succeeded in prevailing upon only seven countries and colonies to admit merely our letters at our domestic rates.

In addition to the foregoing successful negotiations, Mr. Praeger by a series of separate parcel post conventions has obtained admission for American parcel post in 260 countries and colonies whereas our parcel post had been admitted into but 49 countries and colonies when Mr. Praeger assumed charge of the Foreign Mail Service.

When the amount of our foreign correspondence is considered it will easily be seen that the saving resulting from the aforementioned treaties is considerable.

Some New Italian Seaplanes



Upper Row—Left, Four Engined P R B Seaplane, Right, Savoia 21 Racer. Lower Row—Left, Savoia 16-Bis Six-Seater; Right, Savoia 22 Eight-Seater

The accompanying pictures which have just reached Aviation and Aircraft Journal from Guido Mattiolo, our Italian correspondent, show the latest developments of Italian seaplane construction.

The P R B seaplane—the initials of which stand for the names of the designers, Pegna, Rossi and Bastianelli—is one of the largest machines of its kind built in Italy. The boat body is of the long hull-type with V bottom and 10 ft 6 in. beam. The wings are of equal span and are based by three rows of parallel interplane struts. All control surfaces are balanced. Following are the specifications of this machine.

Specifications of P. R. B. Seaplane

Span, 105 ft 8 in
Length overall, 59 ft 3 in
Height, 22 ft 8 in
Wing area, 2 300 sq. ft.
Engines four Isotta Fraschini V 6, 275 hp each
Total horsepower, 1 100
Weight empty 8800 lb
Weight loaded 17 600 lb
Maximum speed 105 m p h
Fuel capacity 10 hrs

The Savoia 21 flying boat was especially built for the Schneider Cup race which took place on Aug 7, last at Venice. As may be seen from the illustration in the upper right-hand corner, the span of the upper wings is much smaller than that of the lower ones, the latter alone carrying ailerons. The wing truss is of the Warren type, which is much favored by Italian constructors.

Perhaps the most remarkable detail the photograph discloses is the unusually thin and flat section of the wings and their small chord, although that of the lower wings, not well shown on the illustration, is somewhat larger than that of the uper wings. All control leads are carried inside the hull and the wings.

Although the Savoia 21 is primarily intended as a racing machine, it is stated that its constructors intend to turn it eventually into a pursuit seaplane, for which its high performance makes it particularly adaptable. Whether the wing structure in its present state of design can withstand looping, rolling and spinning seems open to doubt. The machine is reported to have reached during trials a maximum speed in excess of 160 m.p.h., which, if confirmed, would make it the fastest seaplane in the world today.

From the latest information on hand it appears that this machine did not compete for the Schneider Cup race as it was eliminated during the preliminary trials. Its specifications are as follows:

Specifications of the Savoia 21 Seaplane

Span not given. Approximately 26 ft. on lower wings.
Length 25 ft 4 in
Height 8 ft 7 in
Engine, 300 hp. Ansaldo San Giorgio
Weight empty, 1,540 lb
Weight loaded, 1 980 lb
Safety factor, 11
Maximum speed 160 m p.h.
Ceiling 16 500 ft

The Savoia 22 shown in the lower right-hand corner was originally built for the Monaco seaplane meeting of last spring. The machine is now fitted with two 260 hp. Isotta Fraschini V 6 engines, but they will probably be replaced by two 300 hp. Fiat A. 12. The machine seats eight persons.

The specifications are as follows

Specifications of the Savoia 22 Seaplane

Span, 44 ft 8 in
Length overall, 35 ft 6 in
Height maximum, 11 ft. 6 in
Engines, two 260 hp Isotta-Fraschini V 6
Total horsepower 520
Weight empty 3,500 lb
Weight loaded, 5,500 lb.
Safety factor 8
Maximum speed, 100 m p.h.
Fuel capacity 4 hr
Ceiling 20 000 ft.

The Savoia 16-bis six-seater seaplane, shown in the lower left-hand corner, is a machine of much more orthodox design

and represents the latest modifications of the Savoia 16 five-seater commercial flying boat, which enjoys much popularity on the Mediterranean Sea. Machines of this type are being used for passenger services on the French Riviera and also, by a Spanish air transport company, between Barcelona and the Balearic Islands.

Specifications of the Savoia 16-bis are not available, but as the machine is understood to differ but in minor details from its prototype, Model 16, we are giving herewith the specifications of the latter. The clean outline of the hull of the 16-bis are particularly noteworthy.

Specifications of the Savoia 16 Seaplane

Span, 49 ft.
Length overall, 33 ft.
Height maximum, 10 ft. 6 in.
Wing area, 380 sq. ft.
Engine, 300 hp. Fiat A 12
Weight empty, 2,360 lb.
Weight loaded, 4,600 lb.
Maximum speed, 103 m.p.h.
Fuel capacity, 4 hr.

2,007 Passengers in Three Months

The first official report covering commercial flying operations to and from New York just forwarded to the Bureau of Aeronautics, Navy Department, by the Aeromarine Airways shows that the first three months of operations 2,007 passengers were carried 28,171 miles in the air by four flying boats without a single injury. These figures are exclusive of crews, each boat carrying a pilot and mechanic on every flight.

The report covers the first quarter of the sight-seeing service around New York City, and services to and from nearby seashore resorts. The only mishap recorded in the report occurred Sunday, August 7th, when the flying boat "Ambassador" made a forced landing with six passengers in the violent storm while flying from Atlantic City to New York.

It points out that the landing was safely made alongside a yacht belonging to the president of the company, and that the passengers and crew were safely transferred, and the flying boat successfully towed back to the hangar. This forced landing occurred in a storm which was so violent that it actually tore up pavement in the city streets, and blew down garages, and resulted in serious accidents on other forms of transit in and about the city. The flying boat easily weathered this terrific storm and landed its passengers without injury.

The record of the four flying boats in the first three months operations is as follows:

Flying Boat	Hours in air	Mileage flown	Passengers carried
Ambassador	142 03	10,083	597
Waldorf	98 30	3,983	408
Biltmore	83 05	4,384	342
Pennsylvania	98 00	3,712	660
Totals	402 10	28,171	2,007

Calibration of Carburetor Jet Flow *

It has been recognized for some time that many of the discrepancies in carburetor performance can be traced to the use of improperly sized jets and more especially to the variation in flow of jets of the same nominal orifice size and shape. If two jets of the same nominal orifice size and shape, but which pass different quantities of fluid under the same head, are placed in opposite sides of a duplex carburetor, the air-gas mixture on one side will differ from that of the other and the engine performance may be affected. To obviate this trouble it was decided to obtain calibration curves for the carburetor jets in most common use and at the same time determine what the probable error was due to the use of recalibrated jets. The calibration curves, besides giving a standard for each size of jet to conform to, would give a means of estimating closely the size of jet necessary when it was desired to enrich or make lean a given carburetor setting by a given amount.

It has been the custom in Britain for some time to calibrate all carburetor jets by the quantity (in cu. cm.) of standard fluid they would flow under a head of 50 cm. in one minute of time.

Method of Test

An instrument was available for this test in the form of a Brown & Barlow Mark III flow meter, manufactured by Brown & Barlow (Ltd.), Birmingham, England. This is a flow meter of the so-called orifice type and consists of three vertical tubes, the central tube having at its top a float mechanism which maintains a constant head on this tube. The central tube is connected at the bottom to the two glass tubes on either side through calibrated metering orifices. These orifices are of different sizes and determine the range of the instrument. Valves and adapters for the jets are provided at the bottoms of the two outer glass tubes and the scales are placed alongside the glass tubes, the height of the column of gasoline in the outer tube indicating the flow. Changes in head of the outer column is due to the difference between the amount drawn off this column by the jet to be calibrated and the amount of fluid replenished to this same column by the standard orifice under standard head. The scales are calibrated to read in British imperial pints per hour. The two scales of the instrument used have ranges from 30 to 80 pints per hour and from 70 to 180 pints per hour, respectively.

In the test of all Zenith jets 10 of each size were flowed and the average of the results taken as the correct value for the flow of that size. Only five of each size of the Stromberg jets were available to obtain the average value. It was found that the scale with a range of from 30 to 80 pints per hour was the only one necessary for all the runs, none of the jets tested having a flow of over 80 pints per hour. A thermometer was kept in the gasoline supply and data on the specific gravity of the gasoline were available from day to day.

The first series of jets whose flow was taken consisted of a complete set, just as they came from the manufacturer, of standard Zenith U. S. 52 main jets, between the sizes of No. 120 and 200. (The size numbers of Zenith jets are based on their diameter, a No. 120 being 1.2 mm. in diameter, a No. 125 being 1.25 mm. in diameter, etc.)

The jets were then drilled to a larger size, soldered up, and redrilled to drill sizes ranging from 45 to 60. These were then flowed and the results recorded.

The third series of jets flowed consisted of standard Zenith U. S. 52 compensating jets from size 125 to size No. 200.

The fourth series of jets flowed consisted of standard Stromberg old-type jets ranging in size from No. 31 to No. 50. Stromberg jet sizes represent United States standard twist-drill sizes.

The fifth series of jets flowed consisted of standard Stromberg new-type sharp-edge orifice jets ranging in size from No. 31 to No. 50.

The flow meter was itself calibrated to actual flow over the range of the scale by inserting different size jets, recording the scale reading and at the same time obtaining the actual flow by means of a 2,000 cu. cm. flask and a stop watch. Check runs were made for each reading.

Various jets whose flow in the flow meter had been determined were then flowed under a constant head of 50 cm. and the actual discharge by direct measurement obtained. Check runs were made for each reading.

The flow of all Zenith jets smaller in size than 140 dropped below 30 pints per hour and were, therefore, off the scale of the instrument. In this case the flow was taken by means of a graduate and a stop watch, the personal error being eliminated as far as possible by flowing each jet at least five times.

The size of the counterbore in the Zenith compensating jets has a very marked effect on the flow as given by the flow meter, varying the flow as much as 9.7 per cent. For this reason the calibration curve was obtained with jets taken as a standard, the diameter of whose counterbore was 1.8 times the diameter of the jet orifice. The effect of the counterbore on flow when the jet is submerged, as it is in operation, is as yet an unknown variable. The fluid used in all calibrations was domestic aviation gasoline, War Department Specification No. 2-40. Gasoline was renewed often to eliminate any chance of error in flow from change in specific gravity due to the evaporation of the lighter portions of the gasoline.

Analysis

The Brown & Barlow Mark III flow meter is guaranteed by the makers to have an accuracy within less than ±1 per cent. From the calibration by actual flow, the error over the whole scale varied from 0.70 to 0.95 pint per hour. This error, however, was always on the same side; that is, the scale reading was always less than actual flow, and by simply adjusting the scale most of the error could be eliminated. No attempt was made to correct for this error, however, since the readings obtained on the flow meter (except those under a 50 cm. head) represent purely arbitrary constants for rating jets applicable only to this particular apparatus. Under different atmospheric conditions, and slightly different gasoline temperatures, variations in flow on the same jet were never over 0.2 of a pint per hour and, being within the limits of experimental error, were disregarded.

During the tests the level of the gasoline in the glass tubes remained constant after a state of equilibrium had been reached and there was no surging of any kind.

It should be noted that the flow meter used on this test is a consumption flow meter and not a jet calibration flow meter; that is, the scales are calibrated to read in pints per hour of gasoline actually passing the jet being calibrated, and not in pints per hour under a constant head. As the same flow meter will be used for determining jet sizes to be used in carburetors, the calibration or rating curves are plotted, using the actual scale reading without corrections of any kind. However, as described under "Method of Test," the scale of the instrument itself was calibrated by direct measurement against actual flow under a constant head of 50 cm. and the calibration curves made for the jets under this head represent, therefore, actual flow to which no correction needs to be applied.

In the result summary will be found two columns of "per cent error". The first of these columns is the variation between the maximum and minimum flow of all jets of the given size expressed in per cent of the average flow of all jets of that size. The second column of "per cent error" gives the maximum variation of any jet of a given size from the mean as read from the calibration curve.

The variation of the soldered and drilled Zenith jets from the calibration mean as given in the "per cent error" column is taken from the mean of the standard jets, as the soldered and drilled jets will, when flowed for use, be made to conform to the calibration curve of the standard jets.

The curves show that for any series of jets, the flow plotted against size will give a smooth curve over the range used. The tables show that the maximum variation in per cent between jets and maximum variation of any one jet from the calibration mean, respectively, are:

Standard Zenith main jets, 9.30 and 7.56.
Zenith main jets soldered and drilled, 19.33 and 13.21.
Standard Zenith compensating jets, 4.11 and 4.15.
Stromberg old-type jets, 5.20 and 5.52.
Stromberg new-type jets, 2.51 and 2.54.

The improvement of the Stromberg new-type jets over the old-type as regards variation is pronounced, and is probably due to the adoption of the sharp-edged orifice.

Results of Summary

STANDARD ZENITH MAIN JETS
[Average temperature of gasoline, 58° F. Specific gravity of gasoline, 0.710 at 60° F.]

Flow in British pints per hour

Size	Average by scale of flow meter	Maximum by scale of flow meter	Minimum by scale of flow meter	Mean from curve	Under a constant head of 50 cm	Maximum variation between jets in pints per hour flow	Maximum variation between jets in per cent of average flow	Maximum variation from mean of calibration curve	Maximum variation from mean of calibration curve in per cent
120	22.8	23.4	22.0	23.5	18.5	1.3	5.83	1.8	7.08
125	26.2	27.0	25.0	25.3	21.1	1.8	3.30	1.6	6.38
130	27.7	28.3	26.7	27.2	22.7	1.7	3.20	2.1	7.72
135	28.8	28.3	28.2	29.1	23.5	1.1	3.82	.8	3.09
140	30.7	31.3	30.0	30.6	26.6	1.0	3.23	.8	2.31
145	32.8	33.5	32.3	33.0	24.6	1.2	3.88	.7	2.12
150	34.7	35.5	34.5	34.3	36.1	1.6	4.55	.5	0.86
155	37.3	38.3	36.6	36.8	30.6	0.1	3.86	1.8	4.62
160	38.5	40.4	37.0	38.6	38.4	2.4	6.61	1.8	4.68
165	40.7	42.1	39.2	40.8	33.3	2.8	7.32	1.2	3.92
170	42.8	43.7	42.1	43.1	38.4	1.3	3.74	1.0	2.33
175	45.2	46.2	44.1	43.2	42.3	1.3	4.30	1.1	2.48
180	47.8	48.7	47.1	47.5	44.6	1.3	6.14	1.4	2.33
185	46.2	46.8	46.3	46.5	47.3	.3	1.33	.6	1.21
190	51.3	52.2	50.2	51.2	50.2	2.0	3.80	1.3	1.65
195	57.2	53.8	51.6	53.5	52.3	6.5	4.70	0.6	3.73
200	55.3	58.3	53.4	53.2	53.3	3.1	3.60	1.3	3.25

ZENITH SOLDERED AND DRILLED MAIN JETS
[Average temperature of gasoline, 58° F. Specific gravity of gasoline, 0.710 at 60° F.]

60	13.1	20.3	16.7			3.2	13.38		
59	13.7	21.7	18.1			3.6	18.26		
58	18.4	20.4	18.5			1.6	8.79		
57	28.1	21.5	20.3			3.8	17.65		
56	24.3	28.9	23.2	23.1	18.8	2.7	11.11	7.8	18.16
55	26.4	31.7	27.8	28.5	28.4	4.1	13.68	6.7	18.21
54	33.2	35.3	32.5	30.7	28.1	1.6	6.72	2.2	10.40
53	38.1	37.2	33.6	35.3	31.3	3.6	8.34	6.2	3.51
52	33.4	40.7	38.0	38.3	35.0	2.7	6.68	1.6	4.56
51	41.3	46.3	38.5	43.1	38.5	4.1	9.85	5.8	8.33
50	34.7	43.7	44.3	46.2	43.4	1.7	3.80	2.2	4.76
49	48.6	46.6	47.4	48.3	47.6	2.2	4.58	2.1	4.24
48	51.3	53.0	51.0	50.5	51.3	2.0	3.84	1.3	2.66
47	53.4	55.0	53.7	54.3	55.5	1.3	2.38	1.6	3.18
46	57.0	58.3	55.3			1.8	3.16		
45	56.6	57.5	55.1			1.3	2.34		

ZENITH STANDARD COMPENSATING JETS
[Average temperature of gasoline, 68° F. Specific gravity of gasoline, 0.710 at 60° F.]

130	25.3	27.3	26.5	26.5	22.1	1.1	4.11	1.1	4.15
135	28.4	29.3	28.8	29.3	24.8	1.1	3.74	.8	3.05
140	32.1	33.2	31.6	31.6	27.2	1.5	4.68	1.4	4.40
145	34.2	35.0	34.2	34.2	28.7	1.1	3.22	.8	2.34
150	36.7	37.3	36.2	36.6	32.0	1.1	3.00	.6	2.18
155	38.6	39.6	37.3	38.6	33.4	1.0	3.11	1.0	2.58
160	40.3	41.2	40.4	41.0	37.3	.9	2.20	.8	1.66
165	42.3	43.3	42.2	42.2	38.7	.8	1.88	1.2	2.81
170	45.0	46.0	43.6	45.4	42.3	2.1	4.87	1.6	3.97
175	48.1	49.5	47.6	47.7	45.3	1.9	3.85	1.8	3.77
180	50.2	51.1	49.9	48.8	47.3	1.2	2.38	1.3	2.61
185	51.3	54.0	51.1	51.8	50.3	1.4	2.70	1.1	2.12
190	54.0	54.6	53.4	53.8	53.5	1.2	2.22	.6	1.63
195	55.7	58.5	55.5	55.8	55.8	2.3	4.13	.7	1.35
200	57.4	54.1	57.2	57.6	56.7	1.0	1.74	.5	.87

STROMBERG STANDARD NEW TYPE (P 7881)
[Average temperature of gasoline, 88° F. Specific gravity of gasoline, 0.718 at 60° F.]

Flow in British pints per hour

Size	Average by scale of flow meter	Maximum by scale of flow meter	Minimum by scale of flow meter	Mean from curve	Under a constant head of 50 cm	Maximum variation between jets in pints per hour flow	Maximum variation between jets in per cent of average flow	Maximum variation from mean of calibration curve	Maximum variation from mean of calibration curve in per cent
50	46.4	46.8	48.0	47.0	34.1	0.6	1.29	1.0	2.13
49	50.0	50.1	49.3	50.1	48.5	.8	.40	.2	.48
48	52.8	52.8	52.1	53.5	53.3	.5	.88	.8	1.70
47	56.7	56.3	55.2	55.2	55.3	1.4	2.51	1.4	2.54
46	57.6	58.6	57.0	57.3	53.2	1.0	2.28	.8	1.39
45	54.4	58.3	58.0	58.4	60.8	.8	1.67	.4	.68
44	61.3	53.3	61.1	61.5	66.3	.8	1.43	.3	.81
43	64.0	64.6	63.3	64.0	71.8	.6	.95	.3	.47
42	67.1	67.6	66.0	67.1	76.0	.4	.60	.3	.63
41	66.3	69.3	66.2	68.3	62.3	1.3	1.66	.3	1.11
40	70.2	70.8	68.3	69.2	65.5	.0	1.28	0	1.38
39	70.3	71.3	70.5	70.6	89.1	1.4	1.67	1.1	1.56
38	72.1	72.3	71.6	72.1	94.3	.3	.48	.3	.28
37	73.0	73.1	72.3	73.1	97.3	.3	.41	.3	.51
36	75.7	74.0	73.3	74.4	103.0	.7	.38	1.1	1.48
35	73.7	78.0	73.5	76.0	110.6	.6	.66	.6	.85
34	76.6	78.2	75.7	73.4	113.3	.6	.66	.7	.59
33	78.3	77.6	76.7	77.2	118.0	.6	1.17	.6	.85
32	78.6	72.8	76.6	78.6	123.8	.1	.18	.7	.89
31	73.5	73.4	76.3	73.7	134.0	.0	.38	.6	.83

* From Air Service Information Circular

STROMBERG STANDARD OLD-TYPE (P 6366)
[Average temperature of gasoline, 58° F. Specific gravity of gasoline, 0.708 at 60° F.]

50	45.5	45.2	45.1	42.5	40.2	0.6	1.72	2.1	4.52
49	46.0	47.0	46.3	47.1	44.9	.1	.21	.3	.42
48	49.0	53.2	49.7	53.2	48.8	.8	.96	.5	1.00
47	52.3	56.4	51.0	52.6	51.7	.5	.08	.7	1.35
46	54.4	54.5	53.1	55.0	55.1	.7	1.29	.2	1.64
45	57.7	59.1	58.1	58.8	57.0	.0	5.20	5.1	5.58
44	63.5	63.2	63.1	66.9	63.4	1.1	1.85	.9	1.82
43	62.8	62.8	62.2	61.8	67.2	.3	.02	.7	1.18
42	63.8	63.5	65.8	63.0	74.2	.7	1.22	1.2	1.85
41	63.7	67.2	68.4	66.8	78.2	.6	.20	.4	.60
40	67.0	68.1	66.2	65.0	81.0	1.8	1.75	1.1	1.82
39	68.8	69.8	68.8	68.8	85.2	1.2	1.73	1.0	1.45
38	70.0	72.5	70.1	70.2	87.8	.4	.57	.3	.40
37	71.0	71.3	70.0	71.8	91.0	.5	.82	.4	.38
36	72.8	72.5	72.0	72.5	95.0	.5	.63	.8	.88
35	74.1	74.0	74.0	74.5	102.0	.5	.07	.5	.40
34	74.7	75.0	74.0	74.7	128.0	.5	.87	.0	.40
33	75.4	76.0	75.9	75.5	108.0	.8	1.06	.0	.28
32	78.0	77.0	78.9	78.5	110.5	.8	.26	.3	.33
31	77.8	75.1	77.7	77.8	122.2	.4	.51	.2	.88

Object of Test

Type of jet	Maximum per cent variation in flow between jets of same nominal orifice size
Zenith standard main jets	0.80
Zenith standard compensating jets	4.98
Stromberg long type jets (old)	5.20
Stromberg sharp-edged orifice-type jets (new)	2.51
Soldered and drilled jets	18.88

Conclusions

The test showed that a large variation in flow exists in carburetor jets of the same nominal orifice size, especially those soldered and drilled, and it is recommended therefore that all jets used in carburetors be calibrated by the use of a flow meter.

Aviation Publicity

W. Dean Smith, Director of the Bureau of Statistics of the American Express Co., expressing his personal views on the need of aviation publicity writes in a letter the following interesting ideas:

There are only two solutions to the problem of developing airplane passenger traffic properly in the United States: (1) The subsidizing of airplane passenger lines by the United States Government. (2) The development of airplane passenger traffic by private companies and capital. It seems to me that judgment by past experience in other lines of commercial development, the second is the only possible solution if we are not to be hopelessly outdistanced in the matter of establishing, maintaining and increasing airplane passenger traffic in this country.

Assuming that the second solution is the correct one, and it would seem to be from the increasing number of airplane companies being organized in various sections of the country, we are next confronted with an equally important problem the solution of which is vital to the success of airplane passenger transportation. This problem is the attitude of the public towards the airplane as a safe and reliable means of passenger transportation. I see no other solution to this latter problem except a campaign of education in which every possible means of publicity and every other available channel must be utilized to reach the traveling public and instill in its mind the absolute conviction that airplanes are no longer mere engines of war or unsubstantial contrivances in which dare-devils may indulge in thrilling and fool hardy stunts.

I have watched with considerable interest the attitude of newspapers generally throughout the country in handling stories relating to the halting steps which have so far been made by airplane companies in establishing airplane passenger transportation. The undercurrent of the newspaper stories has been one of implied if not openly expressed frivolity; rarely if ever have I seen one of these stories written in a serious and comprehending manner. In other words the attempts of men of vision to open up airplane passenger transportation have been considered more or less a joke.

I remember distinctly being present at the take off of the two airplanes from the Hudson River several months ago on their journey to their base of operations between Key West and Havana. The occasion was marked by a luncheon tendered army and navy officials, diplomats, representatives of Cuba and newspapermen. It was a red letter day in the progress of commercial aviation. The account that I saw in the papers the next day was a scant stick concerning the event.

This proves conclusively to my mind that the channel of publicity through newspaper stories is practically closed at least for the present and that not until newspapers are forced to treat this matter seriously will that channel ever be open. In order to make newspapers treat the matter seriously, it is absolutely necessary for those engaged in the development of commercial airplane traffic to secure space in the newspapers by paying for it, using this medium to tell the public what it proposes to do, but even more emphatically letting the public know what has been done to make airplane passenger transportation safe and reliable. This would take money of course and it will be a long and hard road before the desired result is achieved, but the eventual dividend will more than repay the cost of the campaign.

When you prevail upon some kindly disposed reporter to write a story of a relatively few lines announcing that you propose to establish an airplane passenger service between New York and Atlantic City with planes every hour on the hour, you reach a pitifully small audience; few but those like myself who are professionally interested in aviation will read the article; that magnificent number of average citizens who peruse it hurriedly will get the reaction that it is a beautiful dream and nothing more and that the other fellow can take a chance if he wants to. If, however, you have a full page advertisement which will, to use slang expression, "knock a man's eye out" setting forth in punchy phrases what you are going to do and what you have done then the public will begin to sit up and take notice. The potentiality of response of the public when properly appealed to is irresistible, but is a mass hard to get in motion.

I would adopt other methods than newspaper publicity to reach the traveling public to educate them to the use of airplanes as a common place every day method of proceeding from one point to another either on business or pleasure. I would inaugurate a campaign of letters addressed to the most prominent, financial, business, professional and social elements of the country at large but more particularly those residing in or near the district through which you propose to operate. These letters I would make of the very highest class in appearance and text and make them absolutely personal in tone and appeal. They must not in the remotest degree have any ear marks of mere circularizing.

I would judiciously extend free transportation to hand picked individuals of standing and influence and thus build up a chain of enthusiasts personally acquainted with your service who will advertise it by word of mouth among other friends and acquaintances. The loss of revenue from this method I should charge to advertising.

There is no question in my mind of the ultimate adoption by the general public of airplanes as an every day means of transportation. I do not believe the time is relatively far distant. I think the moment is at hand when the right psychological publicity brought to bear on the public will wake them up and produce desired results.

Airdrome Notes

Garden City, L. I., N. Y.

The Curtiss Aeroplane & Motor Corp. advises that the Air Mail have erected two wireless poles 150 ft. high, about 100 yd. north of the Curtiss factory at Garden City. Electric lights will be placed on these poles to avoid danger of collision at night.

Pilots using Mitchel, Roosevelt or Curtiss Fields at Garden City should take care in landing that they do not come so low as to collide with these poles.

Loss of the Airship R-38

The rigid airship R-38, which was shortly to be incorporated in the U. S. Navy under the name ZR-2, was accidentally destroyed on Aug. 24 over Hull, England, with heavy loss of life. Of the forty-nine officers and men she carried, seventeen of whom were Americans, only one American and four Britishers were saved. Among those saved are Flight Lieut. A. H. Wann, R.A.F., commander of the airship, and four ratings including Quartermaster N. O. Walker, U. S. N. Among those unaccounted for are Comdr. Louis H. Maxfield, U.S.N., who was to command the ZR-2 under the American flag; Lieuts. Comdrs. Valentine N. Bieg and Emory Coil, U.S.N.; Lieuts. Marcus H. Esterly and Henry W. Hoyt, U.S.N.; Air Commodore E. M. Maitland, R.A.F., commanding the airship base at Howden; Flight Lieuts. G. M. Thomas, C. Little, R. S. Montague, and J. E. M. Pritchard, R.A.F.

From statements by eyewitnesses it appears that the R-38 was flying over Hull when at about 5.45 p. m. the hull was seen to buckle amidships and break in two. There followed two violent explosions and the two sections of the airship broke into flames and fell into the river Humber. It is believed that most of those missing were killed by the explosions when the hydrogen and the gasoline tanks caught fire.

The cause of the accident had not yet been officially determined at the time of going to press, but according to the stories told by some of the survivors the airship broke in two just when she was making high speed turning tests. Two turns were made without difficulty, but on making the third the strain may have been too great for the vessel, for it caused one of the longitudinal girders to buckle. In this connection it is recalled that during a 9-hr. trial flight on July 17 some of the longitudinal girders and transverse frames amidships showed structural weakness and necessitated reinforcement. This was done at Howden, and it was then believed that the modification in her structure—to be anticipated in an experimental type such as the R-38 was—had overcome the initial defects.

Flying Officer Wicks, wireless officer of the R-38, stuck to his post to the last, attempting to communicate with the airship base at Howden. Signals were received at that place from the R-38 after the vessel had begun to buckle, but were undecipherable.

The R-38 was the largest airship ever built. She had a capacity of 2,720,000 cu. ft., being thus 300,000 cu. ft. larger than the German L 71, the largest of the Zeppelin series, which was surrendered to Great Britain under the terms of the Peace Treaty. She was 695 ft. long, 85 ft. 4 in. in diameter, and was propelled by six 350 hp. Sunbeam "Cossack" engines mounted in separate wing cars, placed in pairs side by side, each engine driving a pusher propeller. The designed maximum speed was 70 m.p.h. and this appears to have been exceeded on the full speed trials the R-38 made just before her collapse. Her disposable lift, that is, the useful load available for gasoline and oil, stores, armament, ballast, etc., as originally designed was in excess of 50 tons, but this was subsequently reduced by the addition of a bow mooring gear and also by the reinforcement of the hull.

The hull structure was, in general principle, of standard type such as was used in the Zeppelin airships, but a very considerable saving of structural weight had been effected by a large number of improvements in details. It was built of duralumin, and consisted of a number of longitudinal lattice girders connected transversely by other lattice girders which formed a series of rings, the longitudinals and rings being braced by wires. This structure contained fourteen compartments in each of which was a gas bag made of fabric and goldbeaters-skin. Inside the bottom of the airship and running from end to end was a corridor containing the aluminum gasoline tanks, the fabric water ballast bags, accommodations for bombs and the sleeping and living quarters of the crew when off duty. This corridor was also the means of communication between the various cars and control stations, and of entry from a mooring mast.

The main control station of the airship was in a small car near the bows. This car was not suspended below the hull as in the case of the power cars but projected from the underside of the hull structure, to which it was rigidly attached.

The crew was normally made up of a Captain, Executive Officer, Navigator, Engineer Officer, Radio Officer, Meteorological Officer, three Watch Officers, sixteen mechanics and ten riggers.

The design of the R-38 was decided upon by the British Admiralty in the Spring of 1918. Construction was begun at Messrs. Short Brothers Works at Cardington in November, 1918. In April, 1920, the Works at Cardington were taken over by the Air Ministry, and the greater part of the work of construction of the ZR-2 has been carried out since that date. The history of the airship up to date may, therefore, be summarized in saying that it was designed by the Admiralty, begun by Messrs. Short Brothers and completed by the Air Ministry.

FOKKER S-1 TRAINING MACHINE FITTED WITH A CURTISS OX-5 ENGINE. PILOT AND PASSENGER ARE SEATED SIDE BY SIDE

The World's Airship Types in 1921

By Ladislas d'Orcy

The accompanying tables give the principal characteristics of those of the world's airship types which may be considered representative of modern construction. For this reason no airship type is included which dates back further than 1917. The data are almost entirely taken from official sources, so that the information may in all essentials be considered reliable.

The airship types are listed according to the country of their origin, which arrangement makes it easy to compare the respective merits of the diverse national products. Consequently the tables do not list the airships of foreign origin which may be found in the lighter-than-air services of the various air powers. Thus, for instance, the U. S. Army and Naval Air Services have in commission or in storage a great variety of foreign-built airships (Astra Torres, Chalais-Meudon, N.S., O., Usuelli and Zodiac); some of which were used on active service during the late war, while others were acquired after the Armistice for purposes of comparative study.

A few words regarding the airship situation abroad may not be amiss in this connection. The airship service of the British Royal Air Force has been disbanded for reasons of economy and its rigid airships have been handed over to the Disposal Board of the Ministry of Munitions for sale to private enterprises. Efforts tending toward the establishment of an imperial airship transport service using the ex-R.A.F. vessels have not had any result so far. A number of non-rigid airships of the N.S., C Star and S.S. types has been presented to various dominion governments, including Canada.

Of the war-time French and Italian airship services only a small nucleous remains, a few ships being retained for training purposes. In both countries several service airships have been converted for passenger carrying and with these excursion services are run on experimental routes.

The German war airship service was disbanded as a result of the peace treaty and although the latter does not bar Germany from engaging in commercial air activities, the practical possibilities of a German airship transport service for the time being seem extremely remote. This is due to the decision of the Allies to make Germany pay in kind for the wilful destruction, after the Armistice, of seven naval Zeppelins having an aggregate capacity of approximately 14,000,000 cu. ft. Hence until this figure is reached by new constructions, every German airship is liable to seizure by the Inter-Allied Commission of Aeronautical Control as it happened in the case of the Bodensee and the Nordstern. As the surrender of these ships reduced the "seizable capacity" only to 12,400,000 cu. ft., it seems doubtful that a German enterprise should want to engage in airship construction and operation so long as this provision of the Peace Treaty is in force.

American Airship Types

Type (Year)	Capacity cu. ft.	Length ft.	Diameter ft.	Engines (Propellers)	Total H.P.	D.L. tons	Speed m.p.h.	Range* miles	Crew	Constructor
RIGID AIRSHIPS — NAVAL TYPE										
Z.R.1 (bldg.)	2,500,000	720	80	7 Liberty XII (7)	2,100	35.0	68	4,080	65	Naval Aircraft Factory
NON-RIGID AIRSHIPS — GOODYEAR TYPE										
D (1920)	186,000	198	41.8	2 Union (2)	240	2.0	56	980	5	Goodyear Tire & Rubber Co.
C (1918)	171,000	192	41.8	2 Wright (2)	300	1.6	60	840	5	"
E (1919)	95,000	169	33.5	1 Thomas Morse (1)	180	0.9	56	560	2	
F (1919)	"	"	"	1 Union (1)	120	1.0	52	680	3	"
A (1920)†	"		"	1 Curtiss (1)	80	1.0	46	1,000	6	"
B (1918)	84,000	162	31.5	1 Curtiss (1)	100	0.8	48	460	2	
H‡ (1920)	35,000	95	28	1 Lawrance (1)	30	0.4	43	400	2	
X† (bldg.)	180,000	170	45	2 Aeromarine (3)	350	2.2	60	1,000	6	"

*At normal full speed
† Built for the U. S. Army. All other types were developed for the U. S. Navy
‡ Towing blimp, to be carried on board capital ships

British Airship Types

Type (Year)	Capacity cu. ft.	Length ft.	Diameter ft.	Engines (Propellers)	Total H.P.	D.L. tons	Speed m.p.h.	Range* miles	Crew	Constructor
RIGID AIRSHIPS										
Z.R.2 (1921)	2,750,000	695	85.4	6 Sunbeam "Cossack" (6)	2,100	50.0	70	6,500	30	Royal Airship Works, Bedford
R.36 (1921)	2,123,000	672	78.6	3 Sunbeam, 2 Maybach (5)	1,570	20.0	62	4,000†	28	Beardmore, Glasgow
R.80 (1920)	1,250,000	535	70.6	4 Wolseley Maybach (3)	1,000	18.0	50	6,400	20	Vickers, Ltd., Barrow, I. F.
R.33 (1919)	1,985,000	636	78.6	5 Sunbeam "Maori" (4)	1,250	24.0	62	4,500	22	Armstrong, Newcastle-on-Tyne
R.32 (1918)	1,362,000	615	65.5	5 Rolls-Royce (5)	1,250	16.4	63	2,300	21	Short Bros., Bedford.
NON-RIGID AIRSHIPS										
N.S. (1919)	360,000	262	56.7	2 Fiat (2)	520	6.3	57	2,750	10	Admiralty design, built by contractors
C.Star (1918)	210,000	218	45.2	1 Berliet, 1 Fiat (2)	370	1.6	57	650	3	Admiralty design, built by contractors
S.S.T. (1918)	100,000	165	35.5	2 Rolls-Royce "Hawk" (2)	150	1.0	57	1,230	4	Admiralty design, built by contractors
S.S.Z. (1917)	70,000	143	32.0	1 Rolls-Royce "Hawk" (1)	75	0.3	53	750	3	Admiralty design, built by contractors

* At cruising speed
† As designed for war service. The ship is now fitted with a cabin car for 50 passengers, which has greatly decreased its range

French Airship Types

Type (Year)	Capacity cu. ft.	Length ft.	Diameter ft.	Engines (Propellers)	Total H.P.	D.L. tons	Speed m.p.h.	Range* miles	Crew	Constructor
NON-RIGID AIRSHIPS — CHALAIS-MEUDON TYPE										
C.M.1 (1917)	212,000	255	41	2 Salmson (2)	300	2.0	50	500	5	Army Airship Works
C.M.5 (1918)	316,000	262	46	2 Salmson (2)	460	3.7	51	1,000	8	
NON-RIGID AIRSHIPS — ASTRA-TORRES TYPE										
A.T.1 (1917)	229,000	236	42	3 Renault (2)	600	2.6	47	680	8	Astra Co., Paris.
A.T.? (1917)	671,000	264	62	2 Renault (2)	300	6.1	45	650	6	" "
A.T.13 (1918)	614,000	247	54	2 Hispano or Renault (2)	400 (or 500)	6.4	50	1,000	8	"
A.T.16 (1918)	378,000	263	50	2 Renault (2)	500	4.0	50	1,000	10	" "
NON-RIGID AIRSHIPS — ZODIAC TYPE										
V.Z.1 (1917)	100,000	158	55	2 Renault (2)	180	0.8	48	400	3	Zodiac Co., Paris
V.Z.16 (1918)	110,000	163	35	2 Hispano (2)	300	1.0	56	300	3	" "
Z.D.1 (1917)	210,000	236	46	2 Renault (6)	300	6.8	47	650	5	"
Z.D.U.S. (1920)	365,000	263	60	2 Renault (2)	600	4.2	50	1,000	10	"

* With armament specified, at cruising speed

German Airship Types

Type (Year)	Capacity cu. ft.	Length ft.	Diameter ft.	Engines (Propellers)	Total H.P.	D.L. tons	Speed m.p.h.	Range miles	Crew	Constructor
RIGID AIRSHIPS — ZEPPELIN TYPE										
L.71 (1918)	2,418,000	745	79	6 Maybach (6)	1,740	48.0	75	7,300*	30	Zeppelin Co.
BODENSEE (1915)	800,000	417.5	61.7	4 Maybach (3)	1,040	11.3	63	1,100†	17	" "
SEMI-RIGID AIRSHIPS — PARSEVAL TYPE										
P.L.27 (1917)	1,094,000	531.4	69	4 Maybach (4)	960	16.0	56	2,500	18	Parseval Co.

* Range at cruising speed without armament.
† Range at cruising speed with commercial load of 35 passengers.
Note.—After the Armistice the L.71 was surrendered to Great Britain, and her sistership, the L.72, to France. The BODENSEE was surrendered to Italy and her sistership, the NORDSTERN, to France.

Italian Airship Types

Type (Year)	Capacity cu. ft.	Length ft.	Diameter ft.	Engines (Propellers)	Total H.P.	D.L. tons	Speed m.p.h.	Range* miles	Crew	Constructor
SEMI-RIGID AIRSHIPS MILITARY TYPE										
D.E. (1918)	62,000	150	34	1 Fiat Colombo (1)	100	0.8	40	700	2	Army Airship Works
O (1918)	127,000	177	36	2 Fiat-Colombo (2)	200	1.1	55	1,350	3	" "
P.V. (1917)	160,000	204	65	2 S.P.A. (2)	450	1.5	63	1,060	4	" "
M (1917)	441,000	268	57	3 S.P.A. (3)	678	4.3	52	2,800	6	" "
ROMA (1920)	1,260,000	412	82	6 Ansaldo (6)	2,400	16.0	68	5,500	12	" "
X (bldg.)	39,000	162	55	2 Ansani (2)	70		46	300		" "
Y (bldg.)	1,470,000	528	82	12 S.P.A. (12)	2,400		68			" "
SEMI-RIGID AIRSHIPS — FORLANINI TYPE										
F.4 (1917)	686,000	295	55	2 Isotta Fraschini (2)	320	6.1	46	3,000	5	L. da Vinci Co., Milan
F.6 (1918)	498,000	307	67	4 Isotta-Fraschini (6)	700	7.6	50	3,500	6	" "

* At cruising speed without armament.

American Gordon - Bennett Team Sails

The American team which is going to challenge Belgium for the Gordon Bennett Balloon Cup on Sept. 18, next, sailed from New York on Aug. 27 on the steamship Finland.

The members of the American Team who have been selected to represent America are Ralph Upson, winner of the National Championship Balloon Race and his aide C. G. Andrus of the United States Weather Bureau. The Akron Chamber of Commerce is sending Ward T. Van Orman in charge of the Airship Construction Division of the Goodyear Tire and Rubber Co., with Willard B. Seiberling as his aide. Bernard Von Hoffman and J. S. McKibben as aide, represent St. Louis.

This classic of the air has been won four times by America and was captured by the representative of Belgium in the International Balloon Race held last October from Birmingham, Alabama.

Representatives from America, England, France, Belgium, Italy, Spain and Switzerland will compete in this Race.

This handsome trophy was put up by James Gordon Bennett for international competition and is considered the championship sporting classic of the air.

The American team has an excellent chance to win this year and has every confidence that they will bring back this handsome trophy so it may resume its place of honor in the trophy room of the Aero Club of America.

Air Mail Executives

Col. E H Shaughnessy appointed on Apr. 11 by President Harding as Second Assistant Postmaster General is a transportation expert He has always resided in Chicago with the exception of several years spent at smaller cities in Illinois in connection with railway work. He entered the service of the Chicago & North-Western Railway in July, 1899, as a telegrapher and remained continuously in the service of that

Col. E H Shaughnessy, 2nd Ass't. Postmaster General

railroad until May 28, 1917, when leave of absence was granted to enter the military service For services in France Colonel Shaughnessy was awarded the Distinguished Service Medal and the Legion of Honor, Order of the Black Star

As Second Assistant Postmaster General, Colonel Shaughnessy has charge of the Air Mail Service.

Spraying Trees from an Airplane

The novel experiment of spraying a grove of trees from an airplane was made on August 4 over the farm of Harry A. Carver, near Troy, Ohio, to prevent further ravages of worms which have twice practically defoliated this grove of 5000 Catalpa trees. The machine piloted by Lieut John A McCready, Air Service, and carrying E Dormoy, McCook Field, designer, who constructed the sifter used to spray the arsenate of lead powder, flew within 20 or 25 feet of the top of the trees, releasing the powder which was carried by the wind and air currents from the machine's propeller into every part of the grove. Treatment of trees in this manner saves much time and labor, as an airplane in a few minutes can do work which would require a number of men and many pump sprays several days. The effect of this experiment will be watched with interest by entomologists and forestry experts in many parts of the country, especially in the east, where a similar scourge is working havoc with many magnificent elm trees.

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